DOCUMENT RESUME

ED 026 069 JC 690 014

The Need for Plastics Education.

Society of Plastics Engineers, Inc., Stamford, Conn.; Society of the Plastics Industry, Inc., New York, N.Y.
Pub Date Sep 68
Note-24p.
EDRS Price MF-$0.25 HC-$1.30
Descriptors-Chemical Technicians, *Engineers, *Industrial Arts, Industrial Education, *Junior Colleges, *Plastics, Questionnaires, *Technical Education

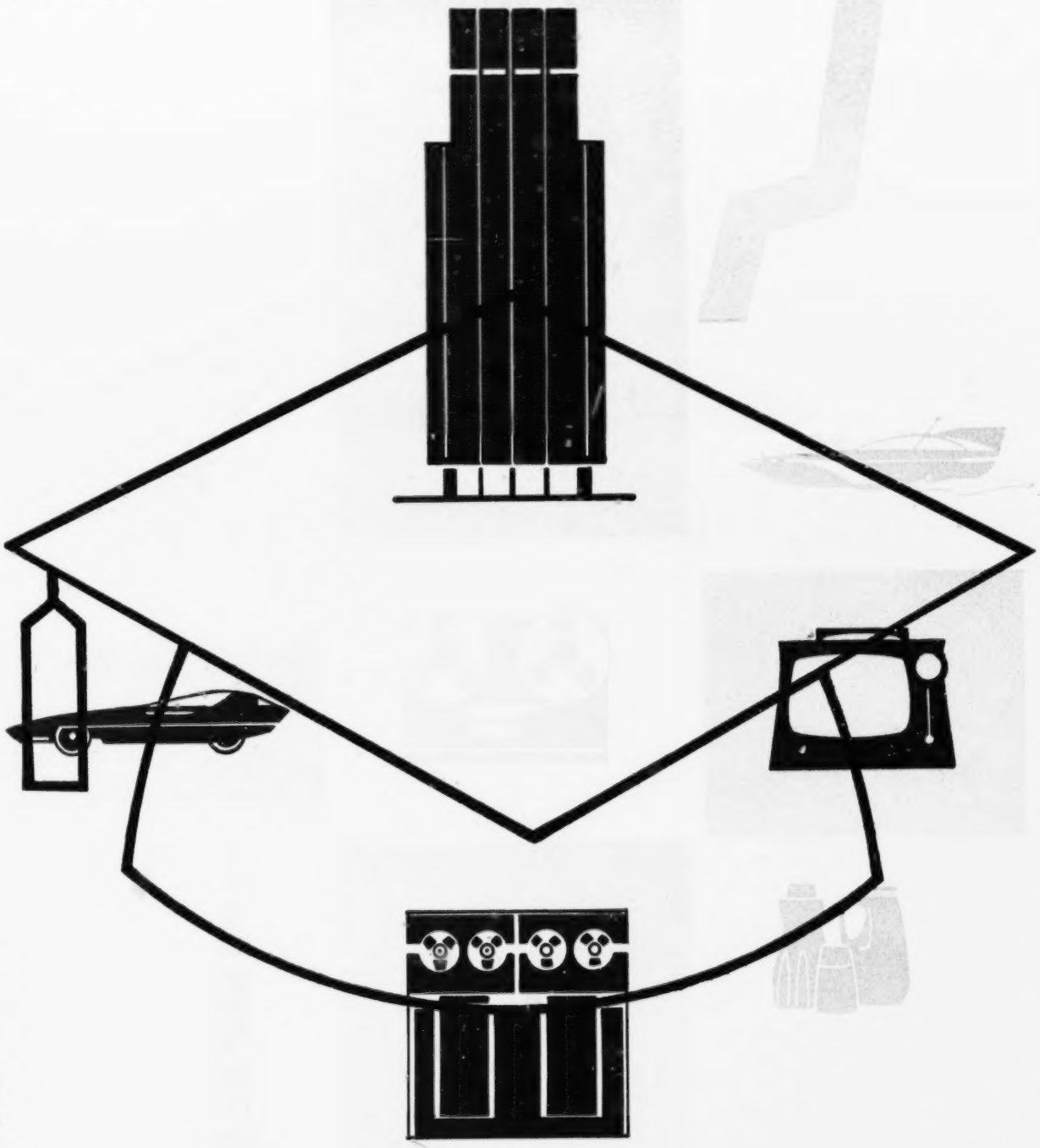
In view of a lack of trained personnel in the industry, the Plastics Education Foundation proposes that educators (1) add more plastics programs, (2) establish plastics engineering degrees at appropriate 4-year institutions, (3) add plastics processing technology to current engineering curricula, and (4) interest younger students in courses and/or apprenticeships. Through the Foundation, industry will contribute funds, equipment, and advisory services to schools offering sound programs. A questionnaire, sent to over 4000 firms, showed a serious and growing shortage in all sizes of company. They need plastics training programs, broad and specialized, at all school levels. Most urgently needed are: mold and die makers; supervisors; mold set-up technicians; product designers and draftsmen; cycle and material technicians; quality controllers; processing and finishing specialists; color and mixing specialists. The industry appreciates the chemists and chemical engineers in the polymer and resin fields, but still needs mechanical and industrial engineers, specialists in plastics, who can work on (1) mold and product design, (2) process engineering, (3) automation, (4) analysis and selection of materials, (5) design, selection, and improvement of machinery. With no exposure to plastics in their schooling, current graduates do not understand even the equipment and materials characteristics. A new B.S. degree in Plastics Engineering and wider publicity of the opportunities in the industry are urged. (HH)

ED026069

The need for plastics education

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.



JC 690 014

A NATIONAL SURVEY OF THE PLASTIC INDUSTRY'S EDUCATIONAL NEEDS
CONDUCTED BY THE JOINT SPE - SPI EDUCATION COMMITTEE

Published September 1968

CALL TO ACTION

This report and the related recommendations constitute a clear call to action by both the plastics industry and educators.

There exists a serious shortage and demand for plastics engineers as well as skilled employees which will increase in magnitude proportionately to the industry's remarkable growth pattern.

There is now a well-documented need for expansion of plastics instruction at all educational levels, including industrial arts, vocational, high school, and college. This need specifically involves establishment of new plastics programs, addition of plastics courses to existing technical school curricula, as well as four-year programs leading to degrees in plastics engineering.

The plastics industry, already cooperating with many educational institutions, has overwhelmingly expressed a willingness to provide substantially greater support in the future.

The survey revealed that finances, equipment, supplies, facilities, and consultation services are available from industry to those educational institutions which offer plastics programs. Accordingly, the industry has indicated it will offer considerably higher starting salaries to new employees with this training.

Robert J. Ullery, Chairman
SPE - SPI Education Task Force

This booklet was made possible through a special plastics education grant from The Dow Chemical Company.

THE NEED FOR PLASTICS EDUCATION

NATIONAL SURVEY

A nationwide survey of plastics processing firms was conducted by a joint SPE-SPI Education Committee. On October 12, 1967 questionnaires were sent to over 4000 firms. Approximately 25% were completed and returned, which is a good sample and considered a true reflection of the industry.

SUMMARY OF RESULTS

There is a serious shortage of trained personnel in the processing industries. This shortage is not regional but nationwide and exists in direct proportion to the geographical location of present plastics processing plants. This shortage is extensive among processing companies of all sizes (small, medium, and large).

NATURE OF SHORTAGE

1. The most critical shortages are for skilled employees and graduate mechanical engineering personnel.
2. 97% of those replying indicated that there will be a continual shortage of trained plastics personnel for at least the next five years, increasing in direct proportion to the industry's growth.
3. A majority of companies reported that they expected to hire more new skilled and engineering employees in the next twelve months than they did during the previous year.
4. The industry needs and wants specialized and broad plastics training programs at both high school and college levels.

FINANCIAL SUPPORT AVAILABLE

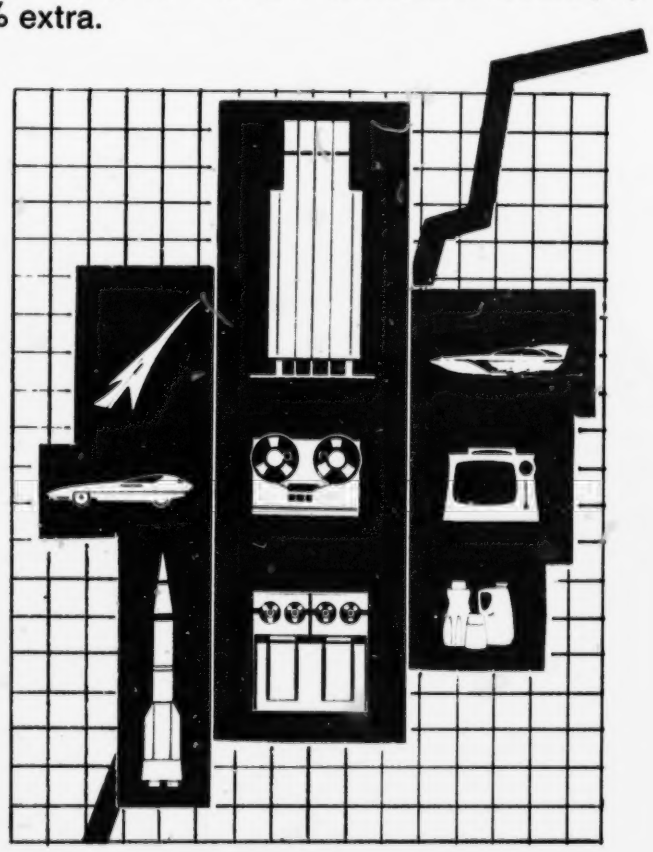
The industry will financially support both company and outside training programs. Approximately 40% indicated they currently support some type of training; of those who do not, most (55%) would financially support a program if it were made available.

About 70% of the companies replying would be willing to make available equipment and/or supplies to educational institutions; over 90% of the larger size companies indicated they would make supplies available.

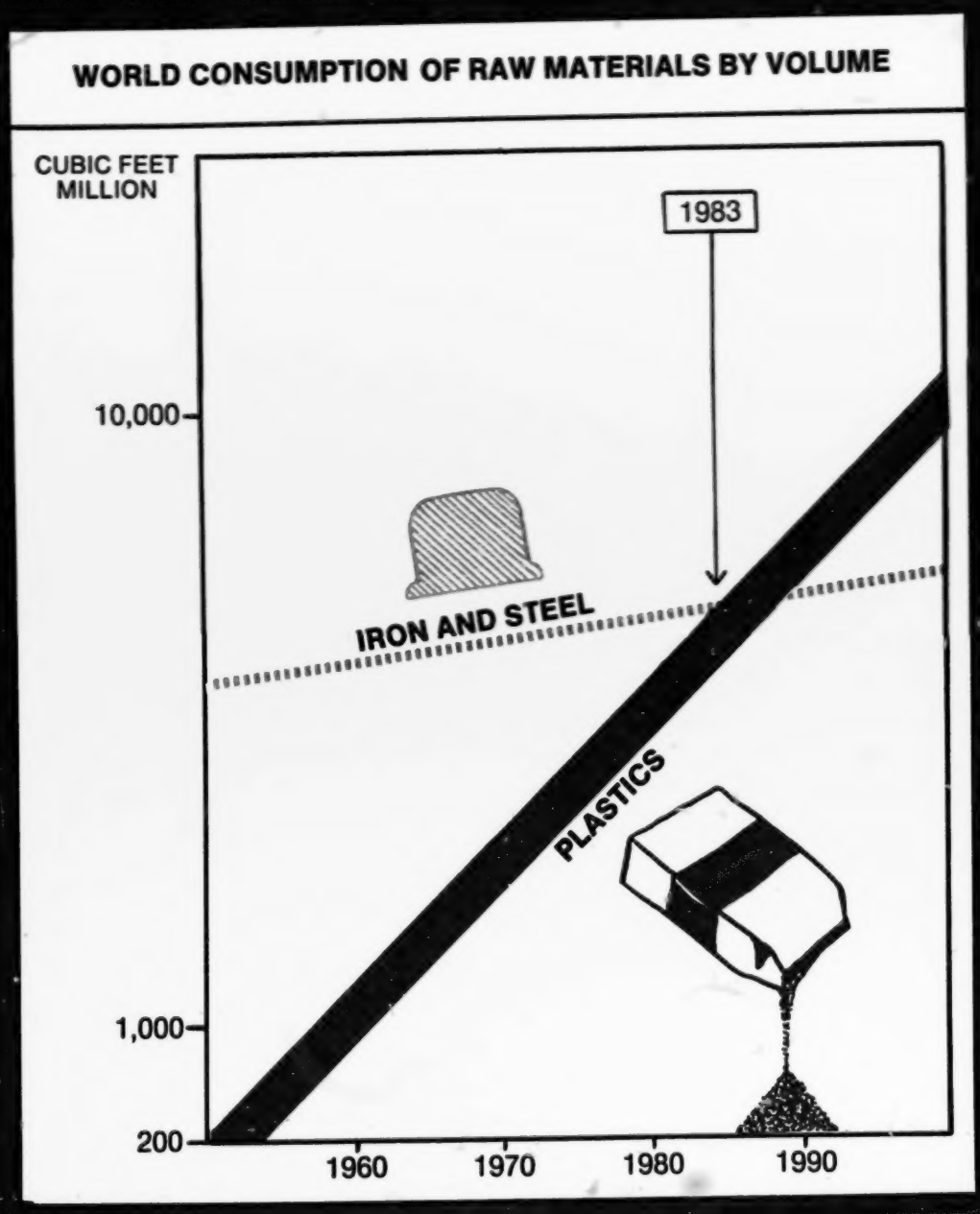
HIGHER STARTING SALARIES

More than two-thirds of the plastics processing firms replying are willing to pay higher starting salaries to new employees who have had pre-employment training.

50% would pay 10% to 20% extra; 20% would pay over 20% extra.



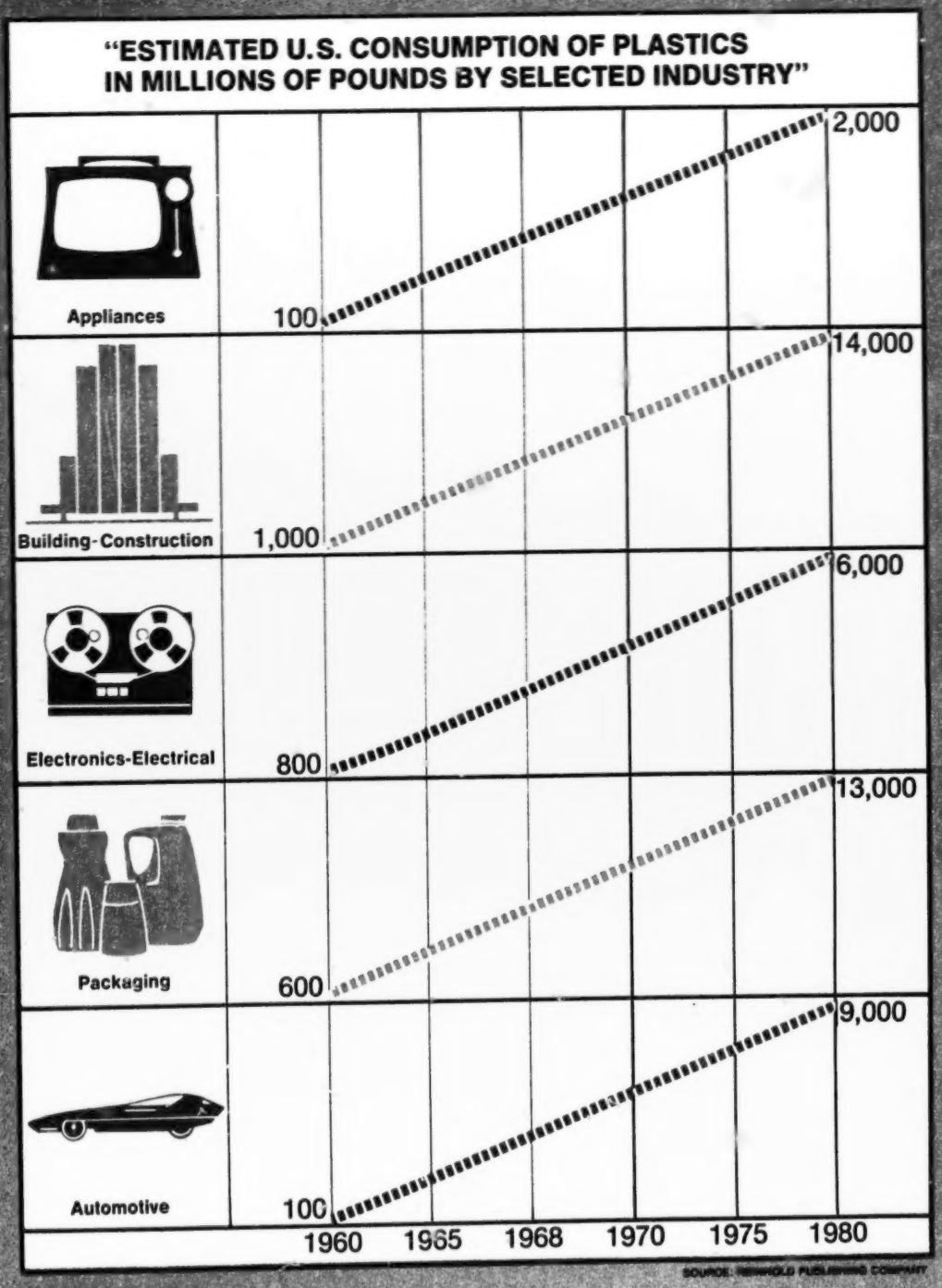
IN THE 1980's THE VOLUME OF PLASTICS WILL EXCEED THAT OF METALS



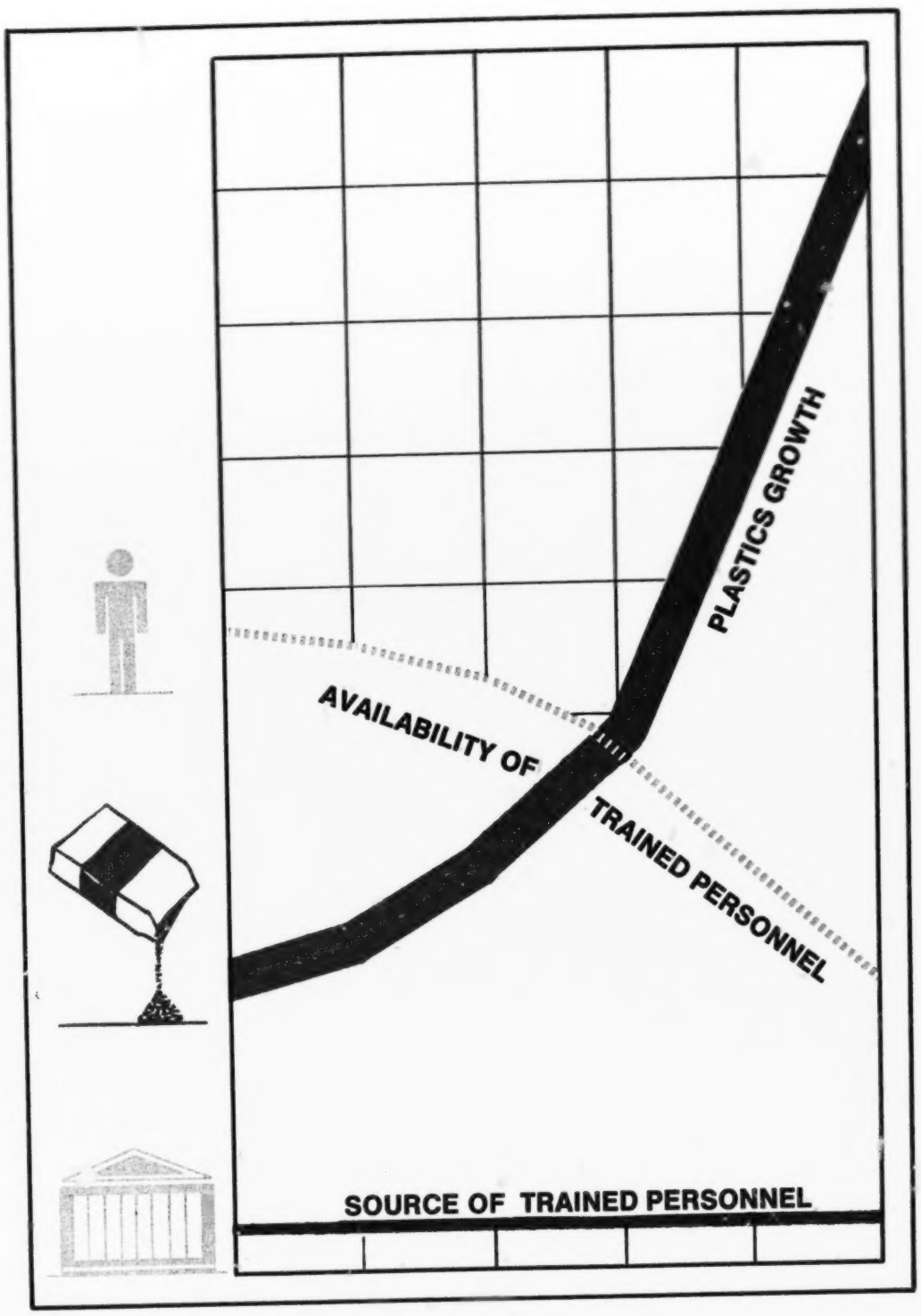
THE PLASTICS AGE—Plastics is the nation's most spectacular growth industry. Since World War II it has been growing at a rate double that of all manufacturing. In the United States its growth is 4 times that of the Gross National Product (GNP) or about 15% per year.

In 1983 the Plastics Age will arrive, when the volume of plastics used for all purposes will exceed the volume of metals. Between now and the 1980's plastics will affect every industry and every type of manufacturing. It will eventually become the basis of the American economy.

THE GROWTH OF PLASTICS BY SELECTED INDUSTRIES



WIDESPREAD USE OF PLASTICS—Plastics is a major industry deeply rooted in almost every type of manufacturing. It has displaced old established materials such as glass, metals, paper, and wood but has also created entirely new markets and new product applications never before possible.


PLASTICS GROWTH
AVAILABILITY OF
TRAINED PERSONNEL
SOURCE OF TRAINED PERSONNEL

THE TIME FOR ACTION IS NOW

While the usage of plastics in industry is increasing at remarkable rates, the availability of trained plastics engineers, technicians, and skilled workers is decreasing at an alarming rate, and a formal source of supply is practically non-existent.

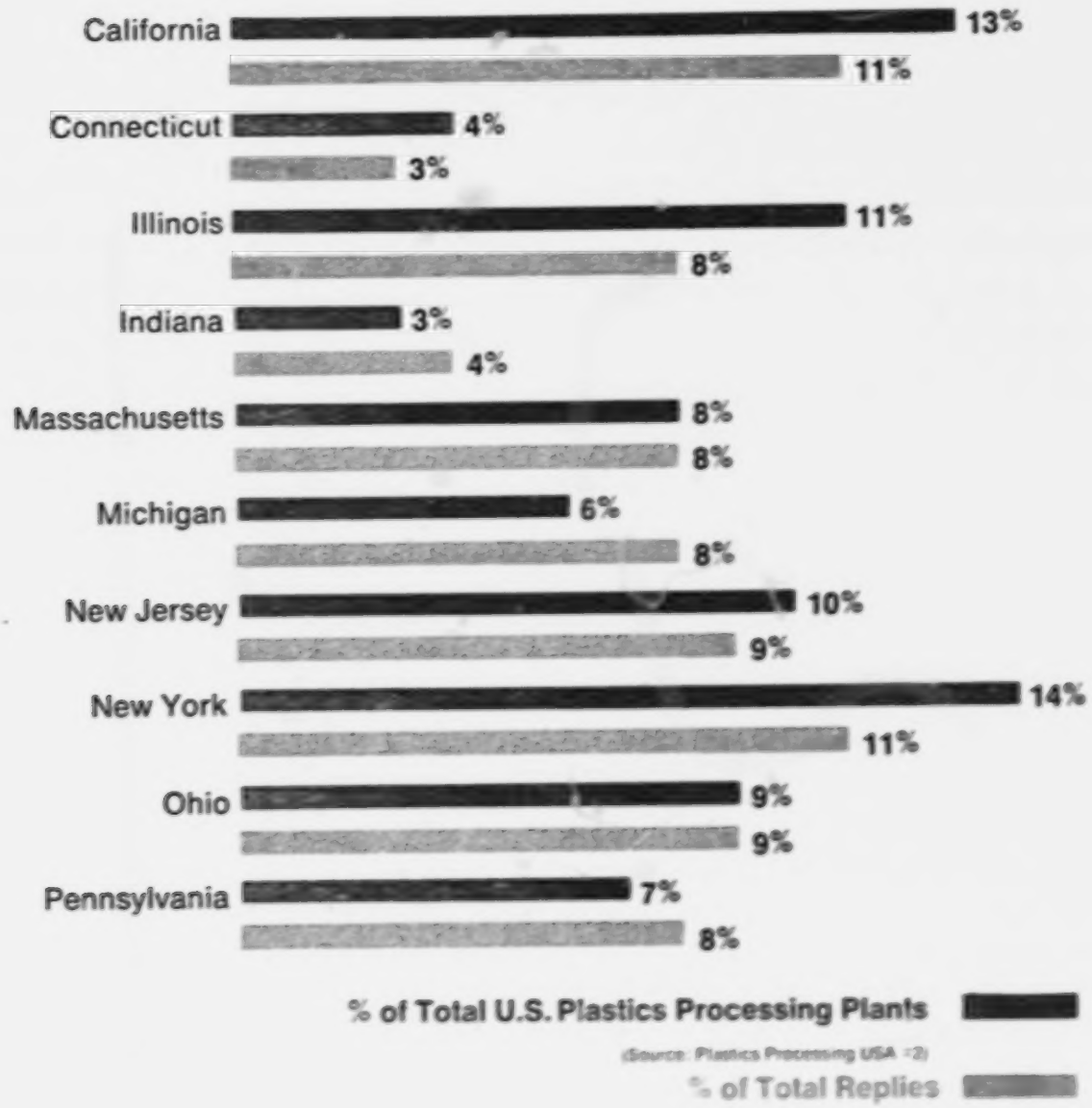
Since plastics is becoming more deeply involved in all types of manufacturing, job requirements and personnel requirements are changing. A knowledge of plastics is essential since it is quickly replacing the old standard materials and processing methods. It is effecting major changes in the manufacturing processes used in every industry—automotive, aircraft, electronics, packaging, construction. We must prepare now to meet this challenge and have the engineering talents and the trained work force available to effectively work with this new manufacturing medium.

This can only be accomplished through educational programs designed to train skilled technical and engineering personnel on all aspects of this relatively new science.

This national survey has revealed that a critical shortage of trained personnel exists at all levels, and this shortage is growing more acute each year.

Educators, parents, students at all grade levels must be made aware of this tremendous industry need and that the opportunities in plastics will be far greater than in any other industry.

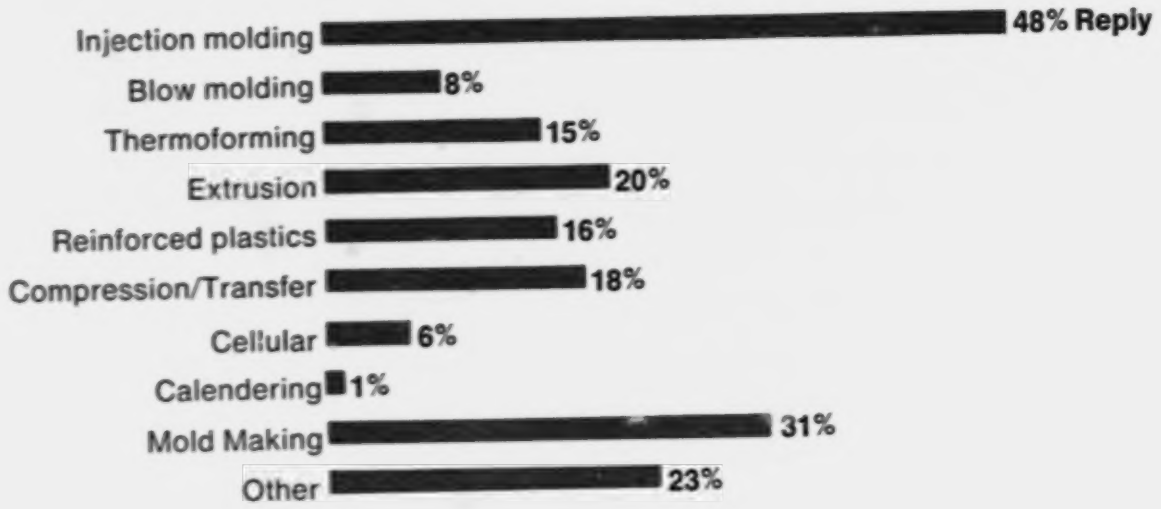
Present Location of the Plastics Industry Compared with Geographical Replies



SOURCE OF INFORMATION—REGIONAL—The percentage of replies from the various sections of the country was very similar to the present geographical location of the plastics processing industry. For example, 50% of the replies came from five states (New York, New Jersey, Ohio, Illinois and California). These five states presently contain 50% of the plastics processing industry.

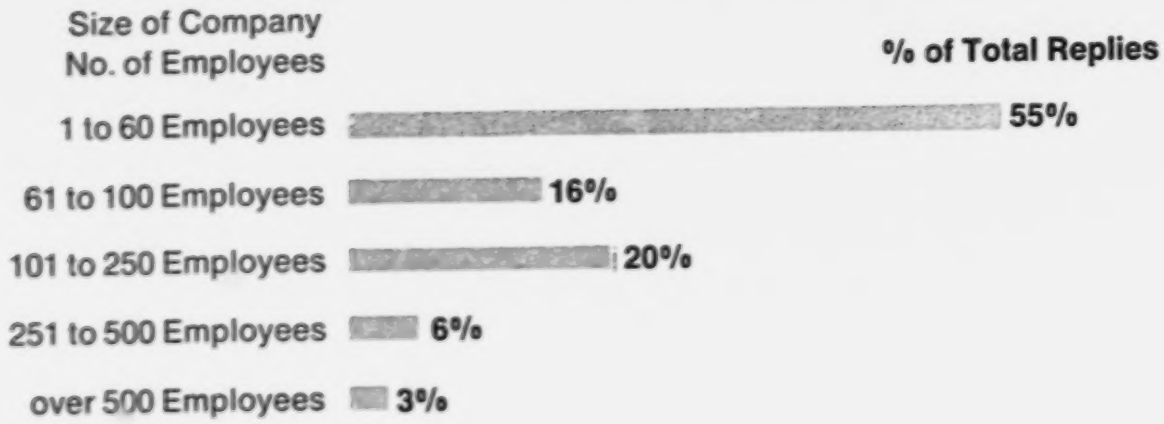
In spite of the concentration of processors in specific locations, the type of responses from all regions was quite uniform in regard to personnel shortages. The need for training programs was equally apparent in states that contained a minimum of processors.

Source of Replies by Type Processing



SOURCE OF INFORMATION BY TYPE PROCESSING—Many companies listed more than one category, which indicates that they were involved with more than one process. The great majority of replies was from companies engaged in molding (injection, compression, transfer) operations and mold makers, both of which are directly dependent on each other and, by the nature of their operations, require skilled labor.

Source of Information by Size of Company Reporting

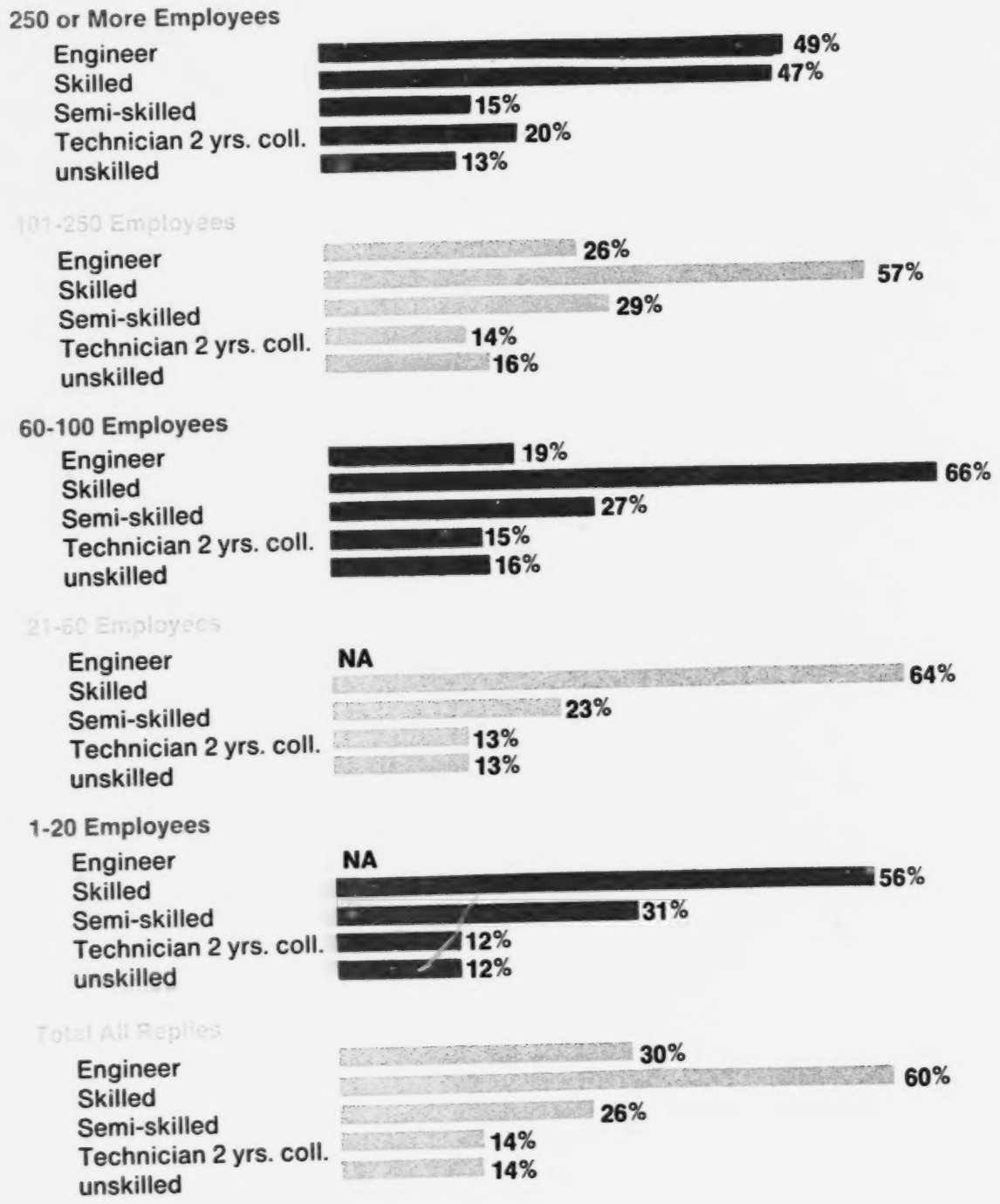


SOURCE OF INFORMATION—SIZE OF COMPANY—More than half of the replies were from companies having 60 or less employees. This again reflects the heavy response from molding and tool making facilities where the total number of employees is relatively small compared with other types of manufacturing.

Over 80% of the replies were from companies with single plant operations. Those facilities with more than one plant were not broken down geographically but were listed by the location of the main or home office.

What Job Level in Your Plastics Operation Do You Find it Most Difficult to Hire?

Replies by Company Size



ANALYSIS OF RESULTS

Skilled employees were considered the most difficult to hire. Sixty per cent of all returns indicated a shortage of skilled employees. This varied only slightly by geography and company size.

Engineers. Larger Companies Report Engineers Difficult to Hire. Companies with 250 or more employees listed engineers as the single most difficult position to fill; these medium to large size companies by nature of their operation maintain large engineering staffs. Those with 250 or more employees represent the bulk of the engineering opportunities in the plastics industry. Approximately 50% of all firms with 250 or more employees listed engineers as the most difficult to hire. In addition, 20% of these companies listed technicians with two years' college most critical. It is interesting to note that even some of the smaller firms listed engineers as the most difficult to hire.

The Need for Skilled Employees

MOLD & DIE MAKERS—Among companies of all sizes, the need for skilled workers is considered the most critical. This survey includes the opinions of the tool makers in the industry. The total combined response from the injection, compression/transfer molders and the tool makers accounted for the bulk of all replies. In addition, many plastics molders have their own tool making facility. The mold making function is particularly vital to the success and growth of injection and compression/transfer operations. The inability of the mold making function to keep pace with the growth of the processing industry is directly attributable to the lack of skilled tool makers, machinists and their source of replenishment, the apprentice.

In no other aspect of plastics processing is tool making so vital as with the injection and compression/transfer molders. The complexity of technology, costs, and lead time involved far surpasses that of any other aspect of plastics processing.

Other Essential Positions

Other equally essential positions that require skilled (trained) personnel are listed below. Titles for these positions will vary according to the specific processor; however, the responsibilities are common to all.

1. Supervisors and foremen (tool room, processing and finishing)
2. Mold and product designers and draftsmen
3. Mold set-up technicians
4. Production engineers (cycle and material technicians)
5. Inspectors and quality control technicians
6. Processing, accessory, and finishing machinery specialists
7. Color and material mixing specialists

The Graduate Plastics Engineer

Non-existent—The plastics processors' critical need for graduate mechanical engineers has never before been given serious consideration. To date, the emphasis at the colleges (accredited degree courses), with few exceptions, involves chemical or polymer studies. These consist of both undergraduate and the graduate courses for the chemist and chemical engineer and, accordingly, these graduates serve the polymer and resin producers.

The SPE survey of available college courses clearly reveals that the total concentration has centered on the preprocessing aspects of polymer materials. It is of major benefit to the entire industry that such programs exist, and this has been reflected by the considerably more abundant chemists and chemical engineers involved in the plastics industry. End results have been demonstrated through the continuous development of new, superior, and improved materials, increasing the use of plastics for more products and opening bigger markets. The work in these areas must continue for they certainly serve an important industry need; the processors' need for mechanical and industrial engineers, however, can no longer be overlooked.

Through this survey, for the first time, the industry tells us in no uncertain terms that a large and serious need for the mechanical and industrial type graduate engineers exists. We can safely state without contradiction that graduate plastics engineers currently are rare in the plastics processing plants of today. With one exception, there is no educational facility available in the United States where a four-year curriculum is offered on the mechanical or industrial aspects of plastics processing.

PLASTICS ENGINEER DEFINED

The processor's operation involves the mechanical and industrial type engineer, those who have been trained to serve processing and post-resin manufacturing functions. Specifically, it involves:

a. Mold and product design
b. Process engineering
c. Mold and process automation
d. Processing material analysis and selection
e. Processing machinery design, selection and improvement

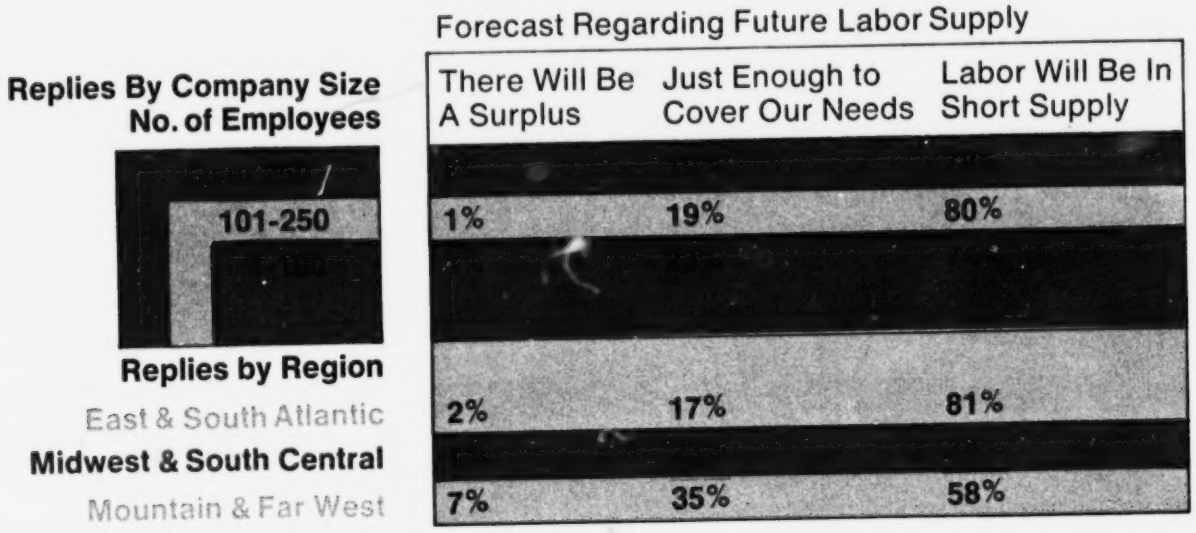
It must be clearly pointed out that those graduate mechanical and industrial engineers currently emerging from our colleges generally do not make immediate contributions in these areas without considerable training and orientation; whereas the graduate chemist, chemical engineer, can make immediate contributions in the polymer areas. In addition, the graduate mechanical engineer, in most cases, has had virtually no exposure to plastics throughout his entire schooling. He should understand the processing equipment used, and he must know the processing characteristics of the various plastics materials used.

From What Sources Do You Hire Plastics Foremen, Supervisors, and Middle Management Personnel?

	Under 1/2	to 3/4	All
Outside the Plastics Industry	39%	23%	13%
Within the Company	26%	41%	26%
Customers	4%	0%	1%

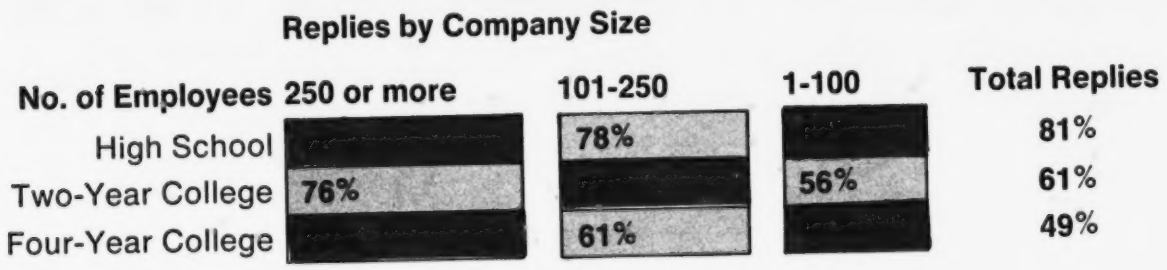
Most companies replying indicated that they hired 25% to 50% of their current middle management employees from other plastics processors. This, of course, does not mitigate the shortage but merely transfers it from company to company. Companies indicate that the largest single source of middle management personnel was from within the company. The second largest single source (25%-100%) was from outside the plastics industry. The next largest source was from schools and colleges.

What will the labor supply be with respect to the next 5 years of your plastics operation?



About 75% indicated labor would be in short supply. (Replies were generally uniform except for those from Far West and Mountain states that registered less pessimistic forecasts. Again, many of these companies were reflected in eastern and mid-western returns.) Companies over 100 employees (those that will have the biggest future needs) were less optimistic than smaller companies.

At what level does the Industry need Pre-Employment Plastics Training?



Almost every company completed this question, and almost all selected at least two categories (out of 615 replies there were 1200 selections) indicating that plastics training is required at more than one school level.

The replies were uniform by geography but varied considerably by company size. The larger firms especially indicated a bigger need for four-year college training than companies under 100. The larger companies, of course, have substantially more positions available for college graduates than the smaller companies.

Would you pay new pre-trained employees higher salaries than non-trained: YES 71% NO 29%

Replies by Company Size No. of Employees	Amount of Extra Pay 10-19% extra	20-29% extra	Over 30% extra
250 or More	36%	15%	2%
101-250	48%	17%	2%
1-100	35%	18%	2%
% of Total Replies	52%	17%	2%

Those companies willing to pay extra to new employees with plastics training were overwhelming. 71% indicated they would pay extra for training; and 29% would not pay extra. Those who designated they would not pay extra increased in direct proportion to company size—47% for companies with 251 or more employees. This may be attributed to labor contract arrangements (in effect with most large firms) which prohibit adjusting starting salary for hourly employees.

Which Would You Prefer To Hire?

	Total Replies	Replies From Companies That Would Pay Extra For Trained Employees
Non-high school graduates willing to learn	6%	6%
High school graduates with no special plastics training	16%	10%
High school graduates with plastics training	78%	84%

78% of all replies indicated a preference for high school graduates with plastics training as compared with 16% for high school graduates with no plastics training, and 6% for non-high school graduates willing to learn. These results were fairly uniform in regard to geography and company size.

84% of companies selecting high school graduates with plastics training were willing to pay extra for pre-employment training.

Do you financially support any kind of Plastics Training for your production employees? YES 42% NO 58%

If you do not support a training program for employees now, would you provide financial support if a quality program were to be made available for your employees? Yes—55%

Replies by Company Size

55% OF THOSE COMPANIES REPLYING STATED THAT THEY DO NOT NOW FINANCIALLY SUPPORT PLASTICS TRAINING BUT WOULD SUPPORT A PROGRAM IF IT WERE MADE AVAILABLE. 51% WOULD OFFER FINANCIAL SUPPORT FOR A COMPANY PROGRAM; 49% WOULD OFFER FINANCIAL SUPPORT FOR AN OUTSTANDING PROGRAM.

Firms That Would Be Willing to Provide Equipment and/or Supplies to Educational Institutions

	Total Replies	Companies With Over 250 Employees
Equipment	60%	82%
Supplies	89%	90%

Over 70% of the companies replying indicated they would make available to educational institutions surplus equipment, supplies, or both. An average of 60% would make equipment available and 89% supplies. Response was uniform by geography and by company size except for those companies with over 250 or more employees, where 82% would make available equipment and 90% supplies.

A PROCLAMATION FROM THE PLASTICS INDUSTRY

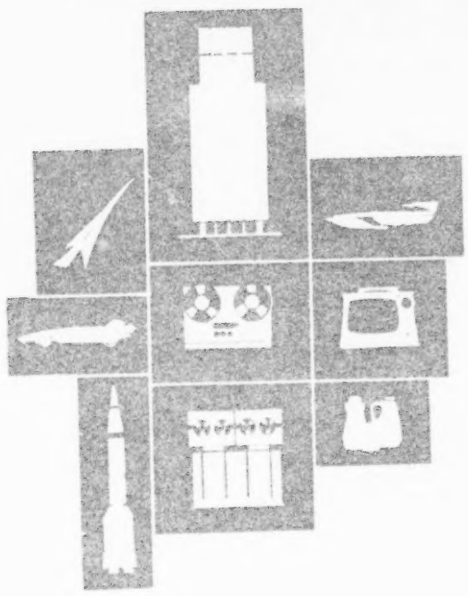
The plastics processors have loudly proclaimed that a serious nationwide shortage of trained plastics employees exists. But what is more important, they have unquestionably declared a willingness to support (financially and otherwise) programs that will relieve this shortage.

In addition, the industry has clearly specified the exact nature of this shortage and the type of employee and training required to relieve it. This they say primarily involves the **skilled employee** and the **graduate engineer;** and the training they want and will support is on the high school, post-high school and college levels.

Remedy. The remedy must commence at all school levels; programs must be developed where engineers are thoroughly exposed to all of the technical aspects of processing so that they can make immediate contributions and have bigger opportunities than those that enter other industries.

In addition, new engineering degrees must be created (i.e., B.S.-Plastics Engineering), distinct from those now existing, which will equip graduates to make immediate contributions in manufacturing.

Finally, undergraduates must be made aware of this tremendous industry need and that their opportunity in plastics will be far greater than in any other industry.



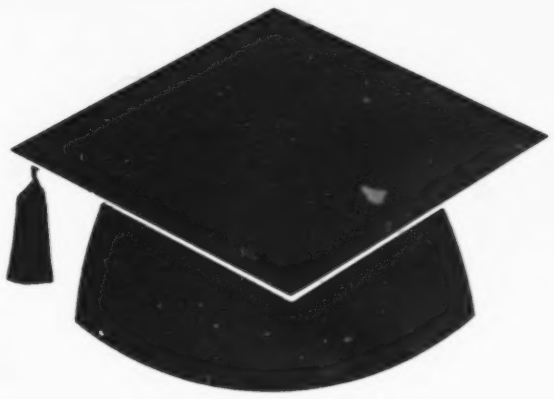
THE PLASTICS EDUCATION FOUNDATION

Because of the critical need for plastics education as revealed by this survey, a Plastics Education Foundation has been created and is jointly sponsored by The Society of Plastics Engineers and The Society of the Plastics Industry.

The objectives of this organization are to cooperate with educational institutions at all levels across the country to alleviate the present shortage of and future demand for trained plastics engineers and skilled personnel. Specific goals are as follows:

1. Increase the availability of plastics educational facilities and courses at high school and post-high school levels.
2. Establishment of four year accredited plastics engineering degrees of a mechanical and industrial engineering nature, at appropriate universities and colleges.
3. Effect the addition of plastics processing technology courses to current (mechanical and industrial nature) engineering school curricula.
4. Induce a substantially greater number of American youth to pursue a plastics career. Effect increased interest of high school and college students as well as potential apprentices at all levels.

The Plastics Education Foundation with funds as well as materials and supplies from industry through donations, grants, trust fund arrangements and other sources will provide financial and material support as well as advisory and other services to schools and universities that offer required plastics educational programs.



ACKNOWLEDGEMENTS

This survey was conducted under the auspices of the Education Committees from The Society of Plastics Engineers and The Society of the Plastics Industry. As chairman of the joint SPE / SPI Education Task Force, which conducted the survey, I want to pay special tribute to Michael A. Delia, President of Delia Associates, who wrote the attached report. Tabulation of the data was under the direction of Dr. Sidney Lirtzman, City University of New York, to whom we are equally indebted. Recognition and appreciation are due all members of the Task Force, listed below. I am pleased to commend this report for your review and action.

Robert J. Ullery, Chairman
SPE / SPI Education Task Force

Paul F. Bruins
POLYTECHNIC INSTITUTE OF BROOKLYN
333 Jay Street
Brooklyn, New York 11201

Colin C. Campbell
SOCIETY OF PLASTICS ENGINEERS
65 Prospect Street
Stamford, Connecticut 06902

Michael A. Delia
DELIA ASSOCIATES
193 Maplewood Avenue
Maplewood, New Jersey 07040

Norman Goldberg
SKILL ACHIEVEMENT INSTITUTE
179 Community Drive
Great Neck, New York

Arthur E. Golomb
CITY UNIVERSITY OF NEW YORK
School of Education
Industrial Arts Department
Convent Avenue at 138th Street
New York, New York 10031

James A. Hamilton
FISHER-PRICE TOYS, INC.
Trimold Division
Edgewood Drive
Holland, New York 14080

Ralph L. Harding, Jr.
THE SOCIETY OF THE PLASTICS INDUSTRY, INC.
250 Park Avenue
New York, New York 10017

Melvin F. Jacolow
MODERN PLASTICS MAGAZINE
1301 Avenue of the Americas
New York, New York 10019

Leslie Kanuk, Mrs.
SKILL ADVANCEMENT INSTITUTE
179 Community Drive
Great Neck, New York 11021

Harold G. Keckler
CONTINENTAL CAN CO., INC.
633 Third Avenue
New York, New York 10017

Sidney Lirtzman
CITY UNIVERSITY OF NEW YORK
School of Education
Industrial Arts Department
Convent Avenue at 138th Street
New York, New York 10031

Joseph D. Madden
THE SOCIETY OF THE PLASTICS INDUSTRY, INC.
250 Park Avenue
New York, New York 10017

Malcolm W. Riley
PLASTICS TECHNOLOGY MAGAZINE
630 Third Avenue
New York, New York 10017

Vivian T. Stannett
NORTH CAROLINA STATE UNIVERSITY
School of Engineering
Department of Chemical Engineering
Raleigh, North Carolina 27607

Anver S. Suleiman
INTERNATIONAL PLASTICS INDUSTRY CONSULTANTS, INC.
P.O. Box 1324
Long Island City, New York 11101

Robert J. Ullery
THE STATE EDUCATION DEPARTMENT
Albany, New York